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Living fungi cells encapsulated in polyelectrolyte shells doped with metal nanoparticles

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Abstract

We report the layer-by-layer coating of living fungi cells (Saccharomyces cerevisiae and Trichoderma asperellum) with polyelectrolytes poly(allylamine hydrochloride)/sodium poly(styrene sulfonate) and bovine serum albumin/DNA and citrate-stabilized gold and silver nanoparticles. It was found that the nanoparticles were effectively incorporated between oppositely charged polyelectrolyte layers, modifying the topography and the roughness of cell walls. The formation of large aggregates of nanoparticles on the cell walls of encapsulated cells was shown. It was found that the encapsulated cells preserved their viability and the shells were soft enough to allow the growth of mycelium. The surface-enhanced Raman scattering (SERS) was used to investigate the biochemical environments of the gold and silver nanoparticles immobilized on the surface of T. asperellum conidia. The SERS spectra from encapsulated conidia and polyelectrolytes indicate that both gold and silver nanoparticles interact with cell walls from different locations, and nanoparticle - polyelectrolyte interaction is limited. The approach described in this paper might have potential applications in modification of living cells.

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